METRIC

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GENERAL SPECIFICATION
FOR
Non Standard Mortar Cartridges

1. SCOPE

1.1 Scope. This specification prescribes the performance requirements and identifies the verification procedures for the Non Standard Mortar Cartridges including 60mm, 82mm, 120mm HE/illuminating/smoke variants.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in section 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in section 5 of this specification, whether or not they are listed.

2.2 Government documents. Not Applicable

2.3 Non-Government publications.

International Maritime Organization (IMO) International Maritime Dangerous Goods Code (IMDG)

United Nations Recommendations on the Transport of Dangerous Goods Model Regulations

International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Technical requirements. Mortar cartridges shall meet the requirements and verifications of this specification for the non-standard mortar mortar cartridges listed in ANNEXES A and B. The non-standard mortar cartridges shall be accompanied with technical data as defined in 6.3.2 of this specification.

3.1.1 Compliance to technical requirements and storage history records. Cartridges shall have evidence of compliance to applicable Technical Data and records of documented storage history of mortar cartridges.

3.1.2 Reduction or elimination of verification procedures. Sufficient evidence of compliance to technical requirements and acceptable storage history of mortar cartridges as determined by SFAE-AMO-MAS-NSA may warrant reduction or elimination of verification procedures in TABLE I of this specification (see 6.2).

3.2 Conformance inspection. A sample of the lot/batch of mortar cartridges shall be subjected to conformance inspection in accordance with 4.1.2, TABLE II, and ANNEXES A and B.

3.3 Serviceability. Mortar cartridges shall be serviceable and issuable without qualification. All parts and assemblies shall be fabricated and finished in a thorough manner. Parts and assemblies shall be free of burrs, chips, dirt, grease, rust corrosion and other foreign material that shall adversely affect fit or function. Coatings and protective finishes shall be uniform and shall provide complete coverage of designated surfaces. The cleaning method used shall not be injurious to any part nor shall the cleaning agent contaminate parts. The painting and marking shall be restored by the assembling facility on any components that have been marred or obliterated. Mortar cartridges shall be of good condition, without visible signs of degradation or deterioration of packaging.

3.3.1 Identification of defects. Defects inherent to the cartridge design and/or manufacturing processes shall be identified within the technical requirements and shall be classified as either a minor, major, or critical defect with a defined method for acceptance rejection of mortar cartridges.

3.4 Interface and interoperability requirements.

3.4.1 Weapon interface. The mortar cartridges configuration shall conform to cannon interface as identified in ANNEX A or as otherwise specified in contract or purchase order.

3.5 Operating requirements. Each cartridge shall provide the following functional, operational, and performance capabilities when fired from any of the weapon systems listed in ANNEXES A and B without any additional ancillary devices, sighting systems, or modifications.

3.5.1 Operating temperatures. Cartridges shall demonstrate the reliability/confidence throughout exposure to ambient and extreme temperatures.

3.5.2 Maximum muzzle velocity. The maximum velocity obtained at ambient temperature testing shall meet the specified characteristics listed in ANNEX B.

3.5.3 Average maximum pressure. The average maximum pressure of the cartridges fired at shall meet the specified characteristics listed in ANNEX B.

3.5.4 Maximum effective range. The maximum effective range of the mortar cartridges shall meet the specified characteristics listed in ANNEX B.

3.5.5 Function and casualty. The cartridges shall function without casualty or cause damage to weapon. Mortar cartridges shall exhibit a ballistic performance free of misfires, duds, premature bursts, short rounds, metal parts separation and early fuze function. The cartridges shall cause no hazard or unsafe condition to the gunner during firing.

3.5.6 Fragmentation. The cartridge shall provide the lethal fragmentations at the desired radius for each item as identified in ANNEX B (High Explosive cartridges only).

3.5.7 Illumination. The cartridge shall provide the intensity of the candlepower illumination as identified in ANNEX B. (Illumination cartridges only)

3.5.8 Fuze identification and description. The fuze shall be identified for the non-standard mortar cartridges in ANNEX A with a drawing / figure of the internal fuze design with components categorized and functional description of the fuze that includes, at a minimum, operating temperatures, in-process tests (ie. jolt/jumble, sensitivity, safe arming/non –arming etc.), and safe separation distances.

3.6 Environmental requirements.

3.6.1 Shelf life. The cartridge shall meet all requirements of this specification within its operating temperature range at a minimum of ten (10) years of storage environments.

3.6.2 Sequential rough handling. Cartridges shall be capable of withstanding the rigors of the sequential rough handling and transportation throughout extreme temperature ranges and meet all performance and safety requirements.

3.7 Ownership and support requirements.

3.7.1 Packing. Packaging and packing shall be in accordance with section 5 of this specification or as otherwise specified in contract or purchase order.

3.7.2 Marking. Marking shall be in accordance with section 5 of this specification or as otherwise specified in contract or purchase order.

4. VERIFICATION

TABLE I. Requirement/verification cross-reference matrix

Section 3 Requirements		Method of Verification 1. Analysis 2. Demonstration 3. Examination 4. Test				Classes of Verification A – Basic Verification B – Verification Procedures		
Section 3	Requirements	Verification Methods				Verification Class		Section 4 Verification Procedures
		1	2	3	4	A	B	
3.1	Technical requirements	X				X		4.1
3.1.2	Compliance to technical requirements and storage history records	X					X	4.2
3.2	Conformance inspection	X	X	X	X	X	X	4.1.2, TABLE II
3.3	Serviceability			X	X		X	4.3
3.3.1	Identification of defects	X				X		4.3
3.4.1	Weapon interface		X				X	4.4.1
3.5.1	Operating temperatures		X		X		X	4.5.1
3.5.2	Maximum muzzle velocity		X		X		X	4.5.2
3.5.3	Average maximum pressure		X		X		X	4.5.3
3.5.4	Maximum effective range		X		X		X	4.5.4
3.5.5	Function and casualty		X		X		X	4.5.5
3.5.6	Fragmentation		X		X		X	4.5.6
3.5.7	Illumination		X		X		X	4.5.7
3.5.8	Fuze type and description		X				X	4.5.8
3.6.1	Shelf life	X					X	4.6.1
3.6.2	Sequential rough handling		X		X		X	4.6.2
3.7.1	Packing			X		X		4.7.1
3.7.2	Marking			X		X		4.7.2

4.1 Technical verification. The cartridges may be subjected to verification of any or all requirements cited in section 3 in this specification, in accordance with the TABLE I. Noncompliance to any requirements shall be cause to withhold acceptance of the lot or batch in which the noncompliance was found.

4.1.1. Lot formation. The cartridges shall be assembled into identifiable lots, sublots, or batches, or in such other manner as may be prescribed. Each lot or batch shall, as far as practicable, consist of units of product of a single type, grade, class, size, and composition, manufactured under essentially the same conditions, and at essentially the same time. The lots or batches shall be identified by the contractor and shall be kept intact in adequate and suitable storage space. The formation of lots or batches is desirable for reasons of homogeneity

4.1.2 Conformance verification. The mortar cartridges shall be subjected to verification in accordance with TABLE II of this specification.

4.1.3 Conformance acceptance. Acceptance of mortar cartridges shall be based on compliance with verification in accordance with TABLE II of this specification. Failure to meet requirements of TABLE II shall be cause to withhold acceptance of lot or batch for which verification was performed.

TABLE II. Verification procedures and inspection

Examination or Test	Requirement Paragraph	Inspection Method	Sample Size
Compliance to technical requirements and storage history records.	3.1.1	4.2	1
Serviceability	3.3	4.3	**See Note 1**
Identification of defects	3.3.1	4.3	**See Note 1**
Weapon interface	3.4.1	4.4.1	Annex A
Operating temperatures	3.5.1	4.5.1	Annex A
Maximum muzzle velocity	3.5.2	4.5.2	Annex A
Average maximum pressure	3.5.3	4.5.3	Annex A
Maximum effective range	3.5.4	4.5.4	Annex A
Function and casualty	3.5.5	4.5.5	Annex A
Fragmentation	3.5.6	4.5.6	Annex A
Illumination	3.5.7	4.5.7	Annex A
Fuze type and description	3.5.8	4.5.8	Annex A
Packing	3.7.1	4.7.1	2 **(See Note 2)**
Marking	3.7.2	4.7.2	Annex A
Notes: 1 – To be performed using a defined sampling procedure for inspection determined on the mortar cartridge lot sizes 2 – 2 Units of Pallets, Packaging and unit pack will be inspected			

4.2 Verification of evidence of compliance. Evidence shall include, but is not limited to, the following.

4.2.1 Identification of technical requirements to which the mortar cartridges is/was produced.

4.2.2 Producer, date of manufacture and original acceptance documentation.

4.2.3 Initial acceptance reports, including type, lot or batch identification, quantity and method of acceptance (e.g. sample size, verification method, acceptance criteria, results).

4.2.4 Surveillance reports, including lot or batch identification, quantity and method of surveillance (e.g. sample size, verification method, criteria for action to be taken on lot or batch, results).

4.2.5 Storage history, including duration and storage condition (e.g. controlled, uncontrolled).

4.3 Serviceability. A random sample shall be selected from the lot of mortar cartridges using a defined sampling procedure for inspection. The mortar cartridges shall be visually inspected for signs of degradation and the classification of defects identified in the producer's technical data. Any sign of degradation shall constitute failure to show compliance.

4.4 Interface and interoperability requirements.

4.4.1 Weapon interface. A random sample shall be selected from the mortar cartridges to be delivered and inserted into a weapon chamber that conforms to the identified weapon system to check for profile and alignment. Inability to interface properly with weapon system shall be considered a failure to show compliance and constitute a single reliability failure.

4.5 Operating verification.

4.5.1 Operating temperatures. The cartridge shall show evidence of demonstrating reliability throughout exposure to extreme temperatures.

4.5.2 Maximum muzzle velocity. Velocity tests shall be conducted in accordance with producer's test procedure to verify that a sample representative of the lot meets the specified velocity characteristics.

4.5.3 Average maximum pressure. Chamber pressure tests shall be conducted in accordance with the producer's test procedure to verify that a sample representative of the lot meets the specified chamber pressure characteristics.

4.5.4 Maximum effective range. Maximum effective range tests shall be conducted in accordance with the producer's test procedure to verify that a sample representative of the lot meets the specified requirement.

4.5.5 Function and casualty. A random sample shall be selected from the mortar cartridges to be delivered and functioned from the identified weapon system to check for function, casualty and metal parts security. The inability to function without casualty, failure to exhibit proper ballistic performance or damage to caused to the weapon shall be considered a failure and constitute a single reliability failure.

4.5.6 Fragmentation. Fragmentation tests shall be conducted in accordance with the producer's test procedure to verify that a sample representative of the lot meets the specified lethal radius requirement.

4.5.7 Illumination. Illumination tests shall be conducted in accordance with the producer's test procedures to verify that a sample representative of the lot meets the specified candlepower requirement.

4.5.8 Fuze type and description. A sample of the fuzes representative of the lot shall be tested in accordance with the producer's test procedure to verify the lot functions throughout the specified operating temperatures, safety distance, sensitivity and reliability function at the specified target range.

4.6 Environmental verification.

4.6.1 Shelf life. The cartridge shall show evidence of reliable performance over the estimated shelf life.

4.6.2 Sequential rough handling. The sequential rough handling tests shall be performed in accordance with producer's test procedures to verify mortar cartridges and packaging will maintain performance and safety when exposed to the rough handling and temperatures consistent with transportation.

4.7 Support and ownership requirements.

4.7.1 Packing. A random sample of packaging and packing shall be selected from the mortar cartridges to be delivered and visually inspected for defects and compliance to requirements of section 5 of this specification.

4.7.2 Marking. A random sample of packaging and packing shall be selected from the mortar cartridges to be delivered and visually inspected for marking compliance to requirement of paragraph 6.4.5 in this specification.

5. PACKAGING

5.1 Preservation, packaging, packing, unitization, and marking shall provide protection for multiple handling, redistribution, and shipment by any transportation mode and meet or exceed the following requirements.

5.1.1 Packaging containers for hazardous materials, ammunition and explosives shall meet or exceed the requirements found in part 6 of the "United Nations Recommendations on the Transport of Dangerous Goods Model Regulations" and in a manner acceptable to the competent authority of the nation of origin and in accordance with the regulations of all applicable carriers.

5.1.2 Cleanliness - items and packaging shall be free of dirt and other contaminants which would contribute to the deterioration of the item or which would require cleaning by the customer prior to use. Coatings and preservatives applied to the item for protection are not considered contaminants.

5.1.3 Preservation - items susceptible to corrosion or deterioration shall be provided protection against external environmental effects.

5.1.4 Cushioning - items requiring protection from physical and mechanical damage (e.g. fragile, sensitive, critical material) or which could cause physical damage to other items, shall be protected by wrapping, cushioning, pack compartmentalization, or other means to mitigate shock and vibration and prevent damage during handling and shipment.

5.2. Unit Package

5.2.1 Unit package shall be so designed and constructed that it will contain the contents with no damage to the item(s), and with minimal damage to the unit pack during shipment and storage in the shipping container, and will allow subsequent handling. The outermost component of the unit package shall be a container such as a sealed bag, carton, or box.

5.3. Packing

5.3.1 Unit packages must be packed in shipping containers. All shipping containers shall be the most cost effective and shall be of the minimum cube to contain and protect the items.

5.3.2 Shipping Containers - the shipping container (including any necessary blocking, bracing, cushioning, or waterproofing) shall comply with the regulations of the carrier used and shall provide safe delivery to the destination at the lowest tariff cost. The shipping container shall be capable of multiple handling, stacking at least ten feet high, and storage under favorable conditions and meet the requirements of the “United Nations Recommendations on the Transport of Dangerous Goods”.

5.4. Unitization

5.4.1 Shipments of identical items going to the same destination shall be palletized if they have a total cubic displacement of 20 cubic feet or more unless skids or other forklift handling features are included on the containers. Pallet loads must be stable, and to the greatest extent possible, provide a level top for ease of stacking. The weight capacity of the pallet must be adequate for the load. A pallet load shall not exceed 4,000 pounds and should not exceed 52 inches in length or width, or 54 inches in height. The load shall be contained in a manner that will permit safe handling during shipment and storage. 5.4.2 Banding - metal banding shall be used to secure load. Straps shall be applied to each column or layer of boxes. Tie down straps shall be applied to each column of boxes at 90 degrees to the load straps. Edge protectors shall be used when securing fiberboard boxes.

5.5. Marking

5.5.1 Packaging marking shall be visible, clear, and remain legible during normal life cycle handling.

5.5.2 All unit packages, intermediate packs, exterior shipping containers, and, as applicable, unitized loads shall be marked with item description, quantity, lot number, or serial number. The outer shipping container and unitized load shall indicate load weight, UN dangerous goods proper shipping name, and UN number.

5.5.3 Each package shipping container shall show the United Nations packaging symbol and applicable codes in accordance with the construction requirements and testing of packaging as expressed in part 6 of the "United Nations Recommendations on the Transport of Dangerous Goods".

5.6. Additional Requirements for Hazardous Materials

5.6.1 The shipment shall be prepared in accordance with the "United Nations Recommendations on the Transport of Dangerous Goods" and other applicable regulations effective at the time of shipment in a manner acceptable to the competent authority of the nation of origin and in accordance with the regulations of all applicable carriers.

5.6.2 Packaging and marking for hazardous material shall comply with the requirements for the mode of transport and the applicable performance packaging contained in the following documents:

a. International air transport: International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air

b. International vessel transport: International Maritime Organization (IMO) International Maritime Dangerous Goods Code (IMDG).

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Acquisition requirements. Acquisition documents must specify the following:

a. Title and date of this specification.
b. Requirements for certificates of conformance for each lot or shipment of product.
c. Requirements for age of ammunition.
d. Requirements and provisions for submission of data as required.
e. Requirements for acceptance criteria if different than those stated in specification.
f. Requirements for reduction or elimination of verification procedures.
g. Requirements and provisions for contractor and Government verification.
h. Requirements and provisions for packaging of ammunition
i. Requirements and provisions for transportation of ammunition.

6.2 Reduction or elimination of verification procedures. The contract or purchase order will state the minimum requirements for reduction or elimination of verification procedures. Ammunition produced within five (5) years of delivery with evidence of continuous controlled storage, evidence of conformance to and in accordance with applicable technical data that satisfy requirements of production verification of TABLE II of this specification may be reason to reduce or eliminate verification procedures of TABLE II of this specification.

6.3 Definitions.

6.3.1 Non Standard Mortar Cartridges Non standard mortar munitions are those munitions that have not been safety tested and type classified for Army use, cannot be procured through the Army supply. Munitions and explosives that are not managed by National Inventory Control Points, have not been safety tested nor type classified for Army use, do not have a national stock number (NSN) and cannot be procured or requisitioned through the Army or other Department of Defense supply system.

6.3.2 Technical Data. Technical Data is the product specific technical drawing and Quality Assurance (QA) requirements to which ammunition and associated packaging is produced and accepted for each applicable Contract Line Item Number (CLIN). For the purpose of this specification Technical Data, as a minimum, must contain the following: top assembly drawing with revision number, revision date, interface dimensions, and list of component assemblies; packaging and marking drawing with revision number, revision date, and markings; product specification with acceptance test methods with sample size, and accept/reject criteria.

6.3.3 Degradation. Ammunition with gross nonconformance to identified technical requirements, corrosion, cracks, deformation, and spillage.

6.3.4 Deterioration. Packaging ripped, broken, perforated, with water damage, crushed.

Preparing activity:
Army-AR

APPENDIX A, Weapon Interface

High Explosive		
Item	Cannon Compatibility	Sample Size [1]
60mm High Explosive	M57, M6-211LR	90/80 (e.g. 15-0-1)
82mm High Explosive	2B14, M69A	90/80 (e.g. 15-0-1)
120mm High Explosive	2B11, 2S12	90/80 (e.g. 15-0-1)
Illumination		
Item	Cannon Compatibility	Sample Size [1]
60mm Illumination	M57, M6-211LR	90/80 (e.g. 15-0-1)
82mm Illumination	2B14, M69A	90/80 (e.g. 15-0-1)
120mm Illumination	2B11, 2S12	90/80 (e.g. 15-0-1)
Smoke		
Item	Cannon Compatibility	Sample Size [1]
60mm Smoke	M57, M6-211LR	90/80 (e.g. 15-0-1)
82mm Smoke	2B14, M69A	90/80 (e.g. 15-0-1)
120mm Smoke	2B11, 2S12	90/80 (e.g. 15-0-1)

Notes:

1. Acceptance based on demonstration of reliability / confidence (example sampling plan provided in parenthesis sample size – accept – reject)

APPENDIX B – Technical Requirements

High Explosive Mortars[1]				
Item	Maximum Velocity (m/s)	Average chamber pressure (kgf/cm^2)	Max Range (m)	Lethal Fragmentation Radius (m)
60mm	≥ 190	≤ 515	≥ 1500	≥ 10
82mm	≥ 250	≤ 665	≥ 3000	≥ 15
120mm	≥ 270	≤ 985	≥ 6000	≥ 20

Illumination Mortars[1]				
Item	Maximum Velocity (m/s)	Average chamber pressure (kgf/cm^2)	Max Range (m)	Candlepower (Cd)
60mm	≥ 210	≤ 430	≥ 1500	≥ 150,000
82mm	≥ 240	≤ 500	≥ 3000	≥ 500,000
120mm	≥ 300	≤ 660	≥ 5500	≥ 1,000,000

Smoke Mortars[1]			
Item	Maximum Velocity (m/s)	Average chamber pressure (kgf/cm^2)	Maximum Range (m)
60mm	≥ 190	≤ 515	≥ 1500
82mm	≥ 250	≤ 650	≥ 3000
120mm	≥ 270	≤ 950	≥ 6000

Notes:

1. For cartridges not meeting the technical requirements, requests for use must be submitted to SFAE-AMO-MAS-NSA for technical evaluation